STATEMENT OF GUY CARUSO

ADMINISTRATOR

ENERGY INFORMATION ADMINISTRATION

U.S. DEPARTMENT OF ENERGY

before the

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Mr. Chairman and Members of the Committee:

I appreciate the opportunity to appear before you today to discuss the long-term outlook for energy markets in the United States.

The Energy Information Administration (EIA) is an independent statistical and analytical agency within the Department of Energy. We are charged with providing objective, timely, and relevant data, analyses, and projections for the use of the Congress, the Administration, and the public. We do not take positions on policy issues, but we do produce data, analyses, and projections that are meant to assist policymakers in their energy policy deliberations. EIA's baseline projections on energy trends are widely used by government agencies, the private sector, and academia for their own energy analyses. Because we have an element of statutory independence with respect to the analyses, our views are strictly those of EIA and should not be construed as representing those of the Department of Energy or the Administration.

The *Annual Energy Outlook* (*AEO*) provides projections and analysis of domestic energy consumption, supply, prices, and energy-related carbon dioxide emissions through 2030. The *Annual Energy Outlook 2007* (*AEO2007*) is generally based on Federal and State laws and regulations in effect on or before October 31, 2006. (An exception to this approach is that the ethanol tax credit is assumed to continue beyond its scheduled expiration in 2010 in the *AEO2007* reference case.) The potential impacts of pending or proposed legislation, regulations, and standards—or of sections of legislation that have been enacted but that require funds or implementing regulations that have not been provided or specified—are not reflected in the projections.

The *AEO2007* includes consideration of the impact of the Energy Policy Act of 2005 (EPAct2005), signed into law August 8, 2005. Consistent with the general approach adopted in the *AEO*, the reference case does not consider those sections of EPAct2005 that require appropriations for implementation or sections with highly uncertain impacts on energy markets. For example, EIA does not try to anticipate the policy response to the many studies required by EPAct2005 or the impacts of the research and development funding authorizations included in the law. The *AEO2007* reference case only includes those sections of EPAct2005 that establish specific tax credits, incentives, or standards—about 30 of the roughly 500 sections in the legislation.

The *AEO2007* is not meant to be an exact prediction of the future but represents a likely energy future, given technological and demographic trends, current laws and regulations, and consumer behavior as derived from known data. EIA recognizes that projections of energy markets are highly uncertain and subject to many random events that cannot be foreseen such as weather, political disruptions, and technological breakthroughs. In addition to these phenomena, long-term trends in technology development, demographics, economic growth, and energy resources may evolve along a different path than expected in the projections. The complete *AEO2007*, which EIA released last week, includes a large number of alternative cases intended to examine these uncertainties. The following discussion summarizes the highlights from the *AEO2007* reference case for the

major categories of U.S. energy prices, demand, and supply and also includes the results of some alternative cases.

The U.S. Energy Outlook

Energy Prices

The long-term outlook on energy prices in the *AEO2007* reference case (**Figure 1**) is similar to that in last year's *AEO*. World crude oil prices, expressed in terms of the average price of imported low-sulfur, light crude oil to U.S. refiners, are projected to fall from 2006 levels to about $50 per barrel in (2005 dollars) in 2014, then rise to $59 per barrel in 2030. In nominal dollars, the projected price is about $95 in 2030.

Geopolitical trends, the adequacy of investment and the availability of crude oil resources and the degree of access to them, are all inherently uncertain. To evaluate the implications of uncertainty about world crude oil prices, the *AEO2007* includes two other price cases, a high price case and a low price case, based on alternative paths of investment in production capacity in key resource rich regions, access restrictions, and an assessment of the Organization of Petroleum Exporting Countries' (OPEC) ability to influence prices during period of volatility (**Figure 2**). The cases are designed to address the uncertainty about the market behavior of OPEC. Although the price cases reflect alternative long-term trends, they are not designed to reflect short-term, year-to-year volatility in world oil markets, nor are they intended to span the full range of possible outcomes. In the low price case, world crude oil prices are projected to gradually decline from 2006 levels to $34 per barrel (2005 dollars) in 2016 and remain relatively stable in real dollar terms thereafter, rising only slightly to $36 per barrel in 2030. In the high price case, oil prices dips somewhat from 2006 levels, then increase steadily to $100 per barrel (2005 dollars) in 2030.

In the *AEO2007* reference case, average wellhead prices for natural gas in the United States decline gradually from current levels, as increased drilling brings on new supplies and new import sources become available. The average price falls to just under $5 per thousand cubic feet in 2015 (2005 dollars), then rises gradually to about $6 per thousand cubic feet in 2030 (equivalent to $9.63 per thousand cubic feet in nominal dollars). Growth in liquefied natural gas (LNG) imports, Alaskan production, and lower-48 production from unconventional sources are not expected to increase sufficiently to offset the impacts of resource depletion and increased demand in the lower-48 States. Projections of wellhead prices in the low and high price cases reflect alternative assumptions about the cost and availability of natural gas, including imports of LNG.

In the *AEO2007* reference case, average real minemouth coal prices (in 2005 dollars) are expected to fall from $1.15 per million Btu ($23.34 per short ton) in 2005 to $1.08 per million Btu ($21.51 per short ton) in 2019, as prices moderate following a rapid run-up over the past few years. After 2019, new coal-fired power plants are expected to increase total coal demand, and prices are projected to rise to $1.15 per million Btu ($22.60 per short ton) in 2030. Without adjustment for inflation, the average minemouth price of coal in the *AEO2007* reference case rises to $1.85 per million Btu ($36.38 per ton) in 2030.

Electricity prices follow the prices of fuels to power plants in the reference case, falling initially as fuel prices retreat after the rapid increases of recent years and then rising slowly. From a peak of 8.3 cents per kilowatthour (2005 dollars) in 2006, average delivered electricity prices decline to a low of 7.7 cents per kilowatthour in 2015 and then increase to 8.1 cents per kilowatthour in 2030.

Energy Consumption

Total energy consumption is projected to grow by about 31 percent between 2005 and 2030, at a rate of 1.1 percent per year or less than one-half the rate of growth in gross domestic product (GDP) (2.9 percent per year), as energy use per dollar of GDP continues to improve. Fossil fuels account for about 85 percent of the total growth. The increase in coal use occurs mostly in the electric power sector, where strong growth in electricity demand and favorable economics under current environmental policies prompt coal-fired capacity additions. About 61 percent of the projected increase in coal consumption occurs after 2020, when higher natural gas prices make coal the fuel of choice for most new power plants. Transportation accounts for 94 percent of the projected increase in liquids consumption, dominated by growth in fuel use for light-duty vehicles. The remainder of the liquids growth in the *AEO2007* reference cases occurs in the industrial sector, primarily in refineries. Industry and buildings account for about 90 percent of the increase in natural gas consumption from 2005 to 2030.

Transportation energy demand is expected to increase from 28.1 quadrillion British thermal units (Btu) in 2005 to 39.3 quadrillion Btu in 2030, an average growth rate of 1.4 percent per year (**Figure 3**). Most of the growth in demand between 2005 and 2030 occurs in light-duty vehicles (56 percent of total growth), followed by heavy truck travel (23 percent of growth) and air travel (11 percent of growth). Delivered industrial energy consumption reaches 30.5 quadrillion Btu in the *AEO2007* reference case in 2030, growing at an average rate of 0.8 percent per year between 2005 and 2030, as efficiency improvements in the use of energy only partially offset the impact of growth in manufacturing output. Delivered commercial sector energy consumption is projected to grow at a more rapid average annual rate of 1.6 percent between 2005 and 2030, reaching 12.4 quadrillion Btu in 2030, consistent with growth in commercial floorspace. The most rapid increase in commercial energy demand is projected for electricity used for office equipment, computers, telecommunications, and miscellaneous small appliances. Delivered residential energy consumption is projected to grow from 11.6 quadrillion Btu in 2005 to 13.8 quadrillion Btu in 2030, an average rate of 0.7 percent per year. This growth is consistent with population growth and household formation. The most rapid growth in residential energy demand is projected to be in the demand for electricity used to power computers, electronic equipment, and small appliances.

While the EIA reference case incorporates significant improvements in technology cost and performance over time, it may either overstate or understate the actual future pace of improvement since the rate at which the characteristics of energy-using and producing technologies will change is highly uncertain. EIA does not attempt to estimate how increased government spending might specifically impact technology development. However, to illustrate the importance of future technology characteristics, EIA does

develop sensitivity cases with alternative technology assumptions. Relative to the reference case, EIA's high technology cases generally assume earlier availability, lower costs, and higher efficiencies for end-use technologies and new fossil-fired, nuclear, and nonhydroelectric renewable generating technologies. Using high technology assumptions in place of the reference case technology assumptions results in lower projected levels of energy use and energy-related carbon dioxide emissions through 2030 (**Figure 4**) . Generally, the difference between the projections for the two cases grows over the projection horizon, reflecting the greater opportunity for advanced technologies to enter the market as the Nation's energy-producing and -consuming capital stock is replaced and expanded over time.

The reference case includes the effects of several policies aimed at increasing energy efficiency in both end-use technologies and supply technologies, including minimum efficiency standards and voluntary energy savings programs. However, the impact of efficiency improvement on energy consumption could differ from what is shown in the reference case, as illustrated in **Figure 5** which compares energy consumption in three cases. The 2006 technology case assumes no improvement in the efficiency of available equipment beyond that available in 2005. By 2030, 6.5 percent more energy (8.6 quadrillion Btu) is required than in the reference case. The high technology case assumes that the most energy-efficient technologies are available earlier with lower costs and higher efficiencies. By 2030, total energy consumption is 8.8 quadrillion Btu, or 6.7 percent, lower in the high technology case when compared with the reference case.

Total consumption of liquid fuels and other petroleum products is projected to grow at an average annual rate of 1.1 percent in the *AEO2007* reference case, from 20.7 million barrels per day in 2005 to 26.9 million barrels per day in 2030 (**Figure 6**) led by growth in transportation uses, which account for 67 percent of total liquid fuels demand in 2005, increasing to 73 percent in 2030. Improvements in the efficiency of vehicles, planes, and ships are more than offset by growth in travel. In the low and high price cases, petroleum demand in 2030 ranges from 28.8 to 24.6 million barrels per day, respectively.

The *AEO2007* reference case reflects the new fuel economy standards for light trucks finalized by the National Highway Transportation Safety Administration in March 2006 that are based on vehicle footprint and the product mix offered by manufacturers. The new Corporate Average Fuel Economy (CAFE) standard, coupled with technological advances, is expected to have a positive impact on the fuel economy of new light-duty vehicles. Market-driven increases in the sales of alternative vehicle technologies, such as flex-fuel, hybrid, and diesel vehicles, will also have an impact. In the reference case, average fuel economy for new light-duty vehicles is projected to increase to 29.2 miles per gallon in 2030, or 4 miles per gallon higher then the current average.

Additional improvement is projected in the high technology and high price cases, as a result of consumer demand for more fuel-efficient cars and improved economics that make producing them more profitable. In the 2006 technology and low oil price cases, the projections for light-duty vehicle fuel economy in 2030 are lower than those in the reference case, but they still are higher than the 2005 CAFE standard for cars and the 2011 CAFE standard for light trucks. In the low price case, fuel economy for new light-

duty vehicles in 2030 is 3.3 percent lower than projected in the reference case—due to consumer preference for more powerful vehicles over fuel economy—and in the 2006 technology case it is 7 percent lower than in the reference case.

Total consumption of natural gas is projected to increase from 22.0 trillion cubic feet in 2005 to 26.1 trillion cubic feet in 2030, but there is virtually no growth over the last decade. Growth in natural gas consumption between 2020 and 2030 in the residential, commercial, and industrial sectors is offset by a decline in natural gas consumption for electric power generation. Natural gas is expected to lose market share to coal in the electric power sector as result of continued increases in natural gas prices in the latter half of the projection. Natural gas use in the power sector is projected to decline by 18 percent between 2020 and 2030.

Total coal consumption is projected to increase from 22.9 quadrillion Btu (1,128 million short tons) in 2005 to 34.1 quadrillion Btu (1,772 million short tons) in 2030, growing by 1.6 percent per year. About 92 percent of the coal is currently used for electricity generation. Coal remains the primary fuel for electricity generation and its share of generation (including end-use sector generation) is expected to increase from about 50 percent in 2005 to 57 percent in 2030. Total coal consumption in the electric power sector is projected to increase by an average of 1.6 percent per year, from 20.7 quadrillion Btu in 2005 to 31.1 quadrillion Btu in 2030. Another fast growing market for coal is expected in coal-to-liquids (CTL) plants. These plants convert coal to synthetic gas and create clean diesel fuel, while producing surplus electricity as a by-product. In the reference case, coal use in CTL plants is projected to reach 1.8 quadrillion Btu by 2030, or 5 percent of the total coal use. In the high price case, coal used in CTL plants is projected to reach 6.9 quadrillion Btu. In the low price case, however, the plants are not expected to be economical within the 2030 time frame.

Total electricity consumption, including both purchases from electric power producers and on-site generation, is projected to grow from 3,821 billion kilowatthours in 2005 to 5,478 billion kilowatthours in 2030, increasing at an average rate of 1.5 percent per year. The most rapid growth (2.0 percent per year) occurs in the commercial sector, as building floorspace is expanded to accommodate growing service industries. Growing use of electricity for computers, office equipment, and small electrical appliances is partially offset in the *AEO2007* reference case by improved efficiency.

Total marketed renewable fuel consumption (including ethanol for gasoline blending, of which 1.2 quadrillion Btu in 2030 is included with liquid fuels consumption) is projected to grow by 1.9 percent per year in the reference case, from 6.2 quadrillion Btu in 2005 to 9.9 quadrillion Btu in 2030, largely as a result of State mandates for renewable electricity generation and the effect of production tax credits. About 52 percent of the projected demand for renewables in 2030 is for grid-related electricity generation (including combined heat and power), and the rest is for dispersed heating and cooling, industrial uses, and fuel blending.

Ethanol use grows in the *AEO2007* reference case from 4 billion gallons in 2005 to 14.6 billion gallons in 2030 (about 8 percent of total gasoline consumption by volume).

Ethanol use for gasoline blending grows to 14.4 billion gallons and E85 consumption to 0.2 billion gallons in 2030. The ethanol supply is expected to be produced from both corn and cellulose feedstocks, both of which are supported by ethanol tax credits included in EPAct2005, but domestically-grown corn is expected to be the primary source, accounting for 13.6 billion gallons of ethanol production in 2030.

Energy Intensity

Energy intensity, as measured by primary energy use per dollar of GDP (2000 dollars), is projected to decline at an average annual rate of 1.8 percent from 2005 to 2030. Although energy use generally increases as the economy grows, continuing improvement in the energy efficiency of the U.S. economy and a shift to less energy-intensive activities are projected to keep the rate of energy consumption growth lower than the GDP growth rate (**Figure 7**). The projected rate of energy intensity decline in the *AEO2007* approximately matches the decline rate between 1992 and 2005 (1.9 percent per year). Energy-intensive industries' share of overall industrial shipments is projected to fall at an average rate of 0.6 percent per year, a slower decline rate than the 1.2 percent per year experienced from 1992 to 2005.

Historically, energy use per person has varied over time with the level of economic growth, weather conditions, and energy prices, among many other factors. During the late 1970s and early 1980s, energy consumption per capita fell in response to high energy prices and weak economic growth. Starting in the late 1980s and lasting through the mid-1990s, energy consumption per capita increased with declining energy prices and strong economic growth. Per capita energy use is projected to increase by an average of 0.3 percent per year between 2005 and 2030 in the *AEO2007* reference case, with relatively high energy prices moderating the demand for energy services and promoting interest in efficiency improvements in buildings, transportation, and electricity generation.

Energy Production and Imports

Total energy consumption is expected to increase more rapidly than domestic energy supply through 2030. As a result, net imports of energy on a Btu basis are projected to meet a growing share of energy demand.

Liquids and Other Petroleum Products. *AEO2007* includes a reorganized breakdown of fuel categories that reflects the increasing importance of conversion technologies that can produce liquid fuels from natural gas, coal, and biomass. In the past, petroleum production, net imports of petroleum, and refinery gain could be balanced against the supply of liquid fuels and other petroleum products. Now, with other primary energy sources being used to produce significant amounts of liquid fuels, those inputs must be added in order to balance production and supply. Conversely, the use of coal, biomass, and natural gas for liquid fuels production must be accounted for in order to balance net supply against net consumption for each primary fuel. In *AEO2007*, the conversion of nonpetroleum primary fuels to liquid fuels is explicitly modeled, along with petroleum refining, as part of a broadly-defined refining activity that is included in the industrial

sector. *AEO2007* specifically accounts for conversion losses and co-product outputs in the broadly defined refining activity.

Projected U.S. crude oil production increases from 5.2 million barrels per day in 2005 to a peak of 5.9 million barrels per day in 2017 as a result of increased production offshore, predominantly in the deep waters of the Gulf of Mexico. Production is subsequently projected to fall to 5.4 million barrels per day in 2030. Total domestic liquids production (crude oil, natural gas plant liquids, refinery processing gains, coal-to-liquids, gas-to-liquids, ethanol, blending components, and biodiesel), increases from 8.3 million barrels per day in 2005 to a peak of 10.5 million barrels per day in 2022 and then remains at about that level through 2030.

Net liquids imports, including both crude oil and refined products, drops from 60 percent of total liquids supply in 2005 to 54 percent in 2009, before increasing to 61 percent in 2030 (**Figure 8**). Under alternative oil price projections, the 2030 import fraction ranges from 67 in the low price case to 49 percent in the high price case. **Figure 9** compares the impact of the *AEO2007* reference, high price, and low price cases on U.S. liquids production, consumption, and imports.

In the U.S. energy markets, the transportation sector consumes about two-thirds of all liquid petroleum products and the industrial sector about one-quarter. The remaining 10 percent is divided among the residential, commercial, and electric power sectors. With limited opportunities for fuel switching in the transportation and industrial sectors, large price-induced changes in U.S. liquid petroleum consumption are unlikely, unless changes in petroleum prices are very large or there are significant changes in the efficiencies of liquid petroleum-using equipment.

Higher crude oil prices spur greater exploration and development of domestic oil supplies, reduce demand for petroleum, and slow the growth of oil imports in the high price case compared to the reference case. Total domestic liquid petroleum supply in 2030 is projected to be 2.0 million barrels per day (19 percent) higher in the high price case than in the reference case. Production in the high case includes 1.7 million barrels per day in 2030 of synthetic petroleum fuel produced from coal and natural gas, compared to 0.4 million barrels per day in the reference case (**Figure 10)**. Total net imports in 2030, including crude oil and refined products, are reduced from 16.4 million barrels per day in the reference case to 12.0 million barrels per day in the high price case.

Natural Gas. Total domestic natural gas production, including supplemental natural gas supplies, increases from 18.3 trillion cubic feet in 2005 to 21.1 trillion cubic feet in 2022, before declining to 20.6 trillion cubic feet in 2030 in the *AEO2007* reference case (**Figure 11**). Lower-48 offshore production is projected to grow from 3.4 trillion cubic feet in 2005 to a peak of 4.6 trillion cubic feet in 2015 as new resources come online in the Gulf of Mexico. After 2015, lower-48 offshore production declines to 3.3 trillion cubic feet in 2030, as investment is inadequate to maintain production levels.

Lower-48 production of unconventional natural gas is expected to be a major contributor to growth in U.S. natural gas supplies. In the *AEO2007* reference case, unconventional

natural gas production is projected to account for 50 percent of domestic U.S. natural gas production in 2030. Unconventional natural gas production is projected to grow from 8.0 trillion cubic feet in 2005 to 10.2 trillion cubic feet in 2030. With completion of an Alaskan natural gas pipeline in 2018, total Alaskan production is projected to increase from 0.5 trillion cubic feet in 2005 to 2.2 trillion cubic feet in 2021 and to remain at about that level through 2030.

Overall reliance on domestic natural gas supply to meet demand is projected to fall from 83 percent in 2005 to 79 percent in 2030. The growing dependence on imports in the United States occurs despite efficiency improvements in both the consumption and the production of natural gas.

Net pipeline imports are expected to decline from 2005 levels of about 3.0 trillion cubic feet to about 0.9 trillion cubic feet by 2030 due to resource depletion in Alberta, growing domestic demand in Canada, and a downward reassessment of the potential for unconventional natural gas production from coal seams and tight formations in Canada. To meet a projected U.S. demand increase of 4.1 trillion cubic feet from 2005 to 2030 and to offset an estimated 2.1 trillion cubic feet reduction in pipeline imports, the United States is expected to depend increasingly on imports of LNG. LNG imports in the *AEO2007* reference case are projected to increase from 0.6 trillion cubic feet in 2005 to 4.5 trillion cubic feet in 2030.

One area of uncertainty examined through sensitivity cases considers the rate of technological progress and its affect on future natural gas supply and prices. Technological progress affects natural gas production by reducing production costs and expanding the economically recoverable natural gas resource base. In the slow oil and gas technology case, advances in exploration and production technologies are assumed to be 50 percent slower than those assumed in the reference case, which are based on historical rates. As a result, domestic natural gas development costs are higher, production is lower, wellhead prices are higher at $6.32 per thousand cubic feet in 2030 (compared to $5.98 in the reference case) (2005 dollars), natural gas consumption is reduced, and LNG imports are higher than in the reference case. In 2030, natural gas production is 18.7 trillion cubic feet (9 percent lower than in the reference case), net natural gas imports are 6.4 trillion cubic feet (18 percent higher), and domestic natural gas consumption is 25.1 trillion cubic feet (3 percent lower). Conversely, the rapid technology case assumes 50 percent faster improvement in technology. In that case, natural gas production in 2030 is 23.5 trillion cubic feet (14 percent higher than in the reference case), net natural gas imports are 4.3 trillion cubic feet (21 percent lower), domestic natural gas consumption is 27.9 trillion cubic feet (7 percent higher), and the average wellhead price is $5.21 per thousand cubic feet.

Coal. As domestic coal demand grows in the *AEO2007* reference case, U.S. coal production is projected to increase at an average rate of 1.6 percent per year, from 1,131 million short tons (23.2 quadrillion Btu) in 2005 to 1,691 million short tons (33.5 quadrillion Btu) in 2030. Production from mines west of the Mississippi River is expected to provide the largest share of the incremental coal production and grows at an average rate of 2.4 percent per year, versus 0.4 percent per year for mines east of the

Mississippi River. In 2030, almost 68 of domestic coal production is projected to originate from States west of the Mississippi (**Figure 12**).

Electricity Generation

In the *AEO2007* reference case, total electricity generation, including generation by electricity producers and on-site, increases by 44 percent between 2005 and 2030, growing at an average rate of 1.5 percent per year. Coal is projected to supply about 75 percent of the increase in electricity generation from 2005 to 2030. Generation from coal is projected to grow from about 2,015 billion kilowatthours in 2005 to 3,330 billion kilowatthours in 2030 in the reference case. In 2030, coal is projected to meet 57 percent of generation, up from 50 percent in 2005 (**Figure 13**). Between 2005 and 2030, *AEO2007* projects that 156 gigawatts of new coal-fired generating capacity will be constructed, including 11 gigawatts at coal-to-liquids plants and 67 gigawatts of integrated gasification combined-cycle plants. Given the assumed continuation of current energy and environmental policies in the reference case, carbon capture and sequestration technology is not projected to come into use during the projection period.

Generation from natural gas is projected to increase from 752 billion killowatthours in 2005 to 1,061 billion killowatthours in 2020, as recently-built plants are used more intensively to meet growing demand. After 2020, however, generation from new coal and nuclear plants is expected to displace some natural-gas-fired generation. Total natural-gas-fired generation declines by 12 percent after 2020 to 937 billion kilowatthours in 2030 and the natural gas share of electricity generation is projected to decline from 19 percent in 2005 to 16 percent in 2030.

Nuclear generating capacity in the *AEO2007* reference case is projected to increase from 100 gigawatts in 2005 to 112.6 gigawatts in 2030. The increase includes 12.5 gigawatts of capacity at newly built nuclear power plants and 3 gigawatts expected from uprates of existing plants, offset by 2.6 gigawatts of retirements. The 12.5 gigawatts of newly built capacity includes 9 gigawatts of new nuclear capacity built in response to the EPAct2005 production tax credits (reflecting a prorated share of the credits as outlined in the 2006 Internal Revenue Service ruling) and 3.5 additional gigawatts of capacity built without credits. *AEO2007* also reflects the change in the Production Tax Credit (PTC) for new nuclear power plants that was included in the Gulf Opportunity Zone Act of 2005 (P.L. 109-135), eliminating the indexing provision in the value of the credit that had been provided in EPAct2005.

Total electricity generation from nuclear power plants is projected to grow from 780 billion kilowatthours in 2005, 19 percent of total generation, to 896 billion kilowatthours in 2030 in the *AEO2007* reference case, accounting for about 15 percent of total generation in 2030. Additional nuclear capacity is projected in some of the alternative *AEO2007* cases, particularly those that project higher demand for electricity or even higher fossil fuel prices.

The use of renewable technologies for electricity generation is projected to grow, stimulated by improved technology, higher fossil fuel prices, and extended tax credits in

EPAct2005 and in State renewable energy programs (renewable portfolio standards, mandates, and goals). The expected impacts of State renewable portfolio standards, which specify a minimum share of generation or sales from renewable sources, are included in the projections. The *AEO2007* reference case includes the extension and expansion of the PTC for renewable generation through December 31, 2007, as enacted in EPAct2005, but not the subsequent extension through the end of 2008 that was enacted in December 2006. Total renewable generation in the *AEO2007* reference case, including hydroelectric power and renewables-fueled combined heat and power generation, is projected to grow by 1.5 percent per year, from 357 billion kilowatthours in 2005 to 519 billion kilowatthours in 2030. The renewable share of electricity generation is projected to remain at about 9 percent of total generation from 2005 to 2030.

Energy-Related Carbon Dioxide Emissions

Absent the application of carbon capture and sequestration technology, which is not expected to come into widespread use without a decrease in the cost of capture and changes in current policies that are not included in the reference case, carbon dioxide emissions from the combustion of fossil fuels are proportional to fuel consumption and carbon content, with coal having the highest carbon content, natural gas the lowest, and petroleum in between.

Carbon dioxide emissions from energy use are projected to increase from 5,945 million metric tons in 2005 to 7,950 million metric tons in 2030 in the *AEO2007*, an average annual increase of 1.2 percent (**Figure 14**). The energy-related carbon dioxide emissions intensity of the U.S. economy is projected to fall from 538 metric tons per million dollars of GDP in 2005 to 353 metric tons per million dollars of GDP in 2030, an average decline of 1.7 percent per year. Projected increases in carbon dioxide emissions primarily result from a continued reliance on coal for electricity generation and on petroleum fuels in the transportation sector.

Conclusion

As I noted at the outset, EIA does not take positions on policy issues, but we do produce data, analyses, and projections that are meant to assist policymakers in their energy policy deliberations. The *AEO2007* results that I have discussed this morning are intended to serve that broad purpose. EIA has also completed several analyses of the energy and economic impacts of alternative proposals to limit greenhouse gas emissions over the past several years.

We look forward to providing whatever further analytical support that you may require on topics ranging from greenhouse gas limitation to energy security challenges facing the Nation to the impacts of policies to promote greater use of renewable energy sources. We believe that such analyses can help to identify both potential synergies and potential conflicts among different energy-related objectives that are currently under discussion in this Committee and elsewhere.

This concludes my testimony, Mr. Chairman and members of the Committee. I would be happy to answer any questions you may have.

Figure 1. Energy Prices, 1980-2030 (index, 1980=1.0)

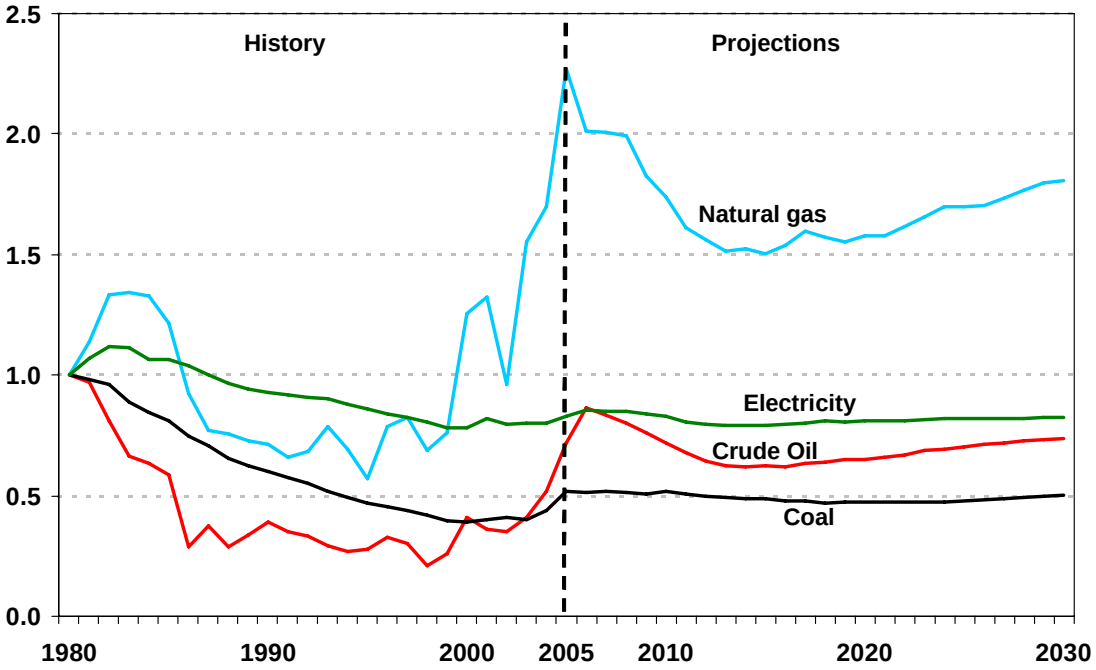

Figure 2. World Oil Prices in Four Cases, 1980-2030 (2005 dollars per barrel)

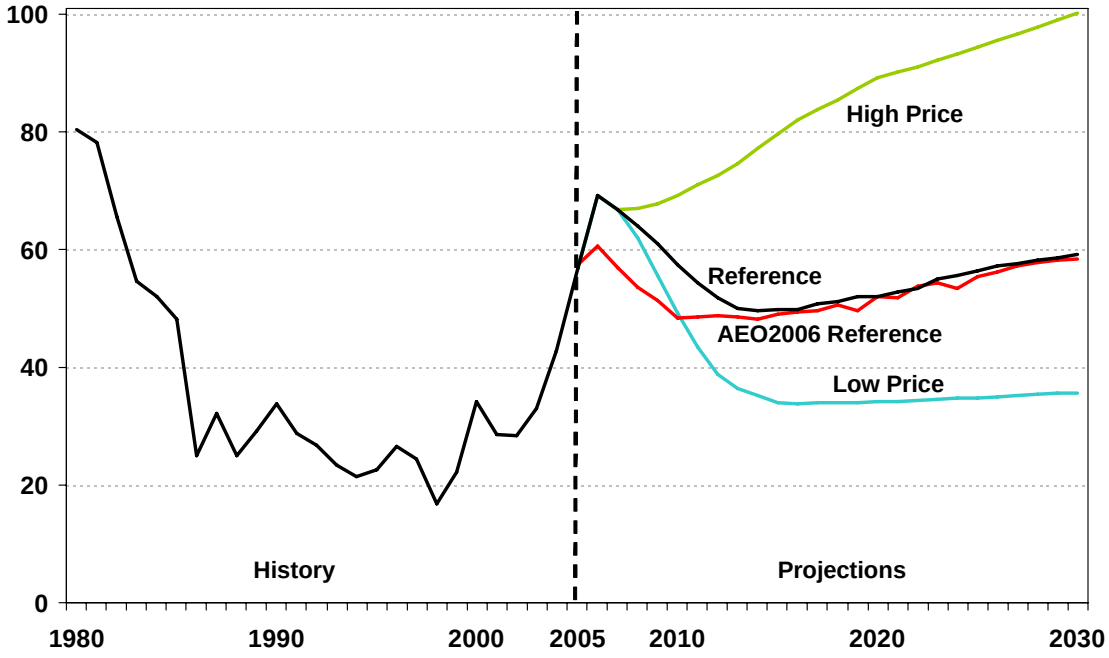

Figure 3. Delivered Energy Consumption by Sector, 2005 and 2030 (quadrillion Btu)

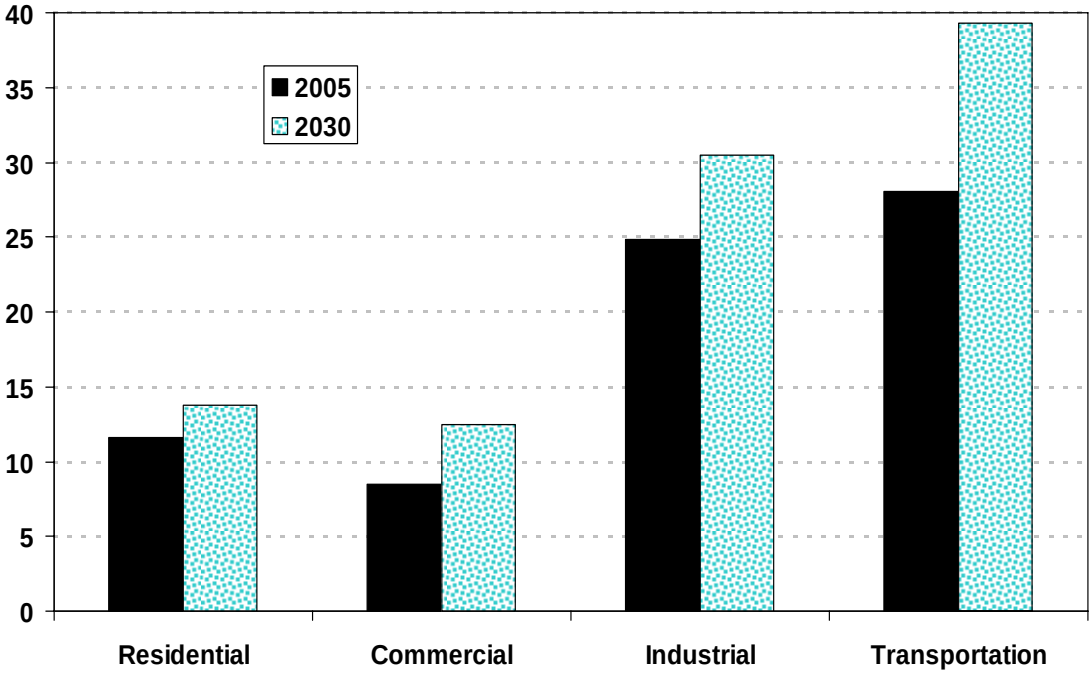

Figure 4. U.S. Energy Consumption and Energy-Related Carbon Dioxide Emissions in Two Cases, 1980-2030

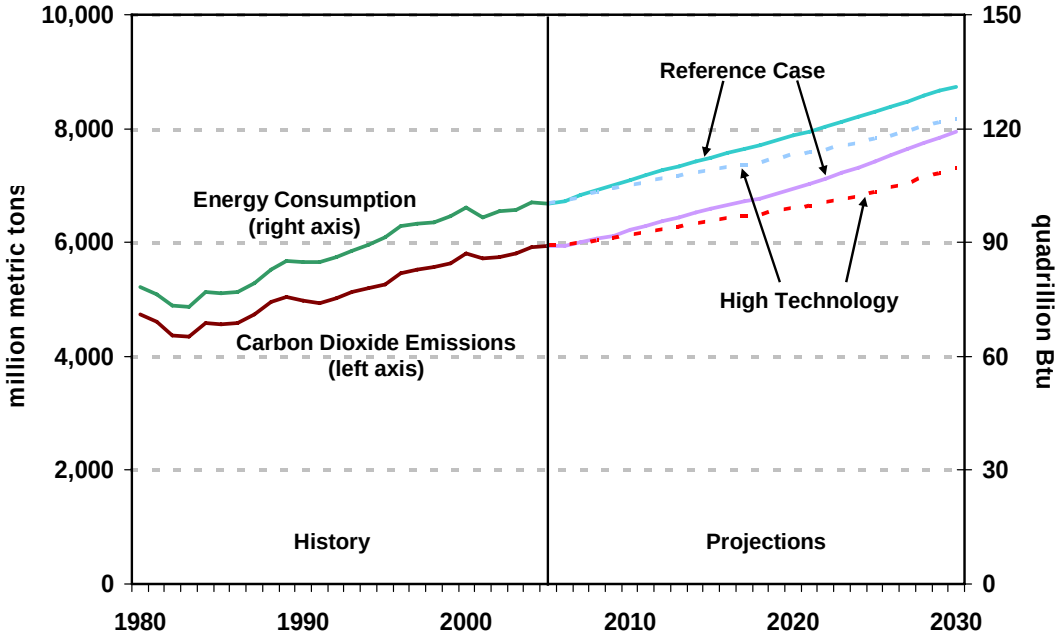

Figure 5. U.S. Energy Consumption in Three Cases, 1980-2030 (quadrillion Btu)

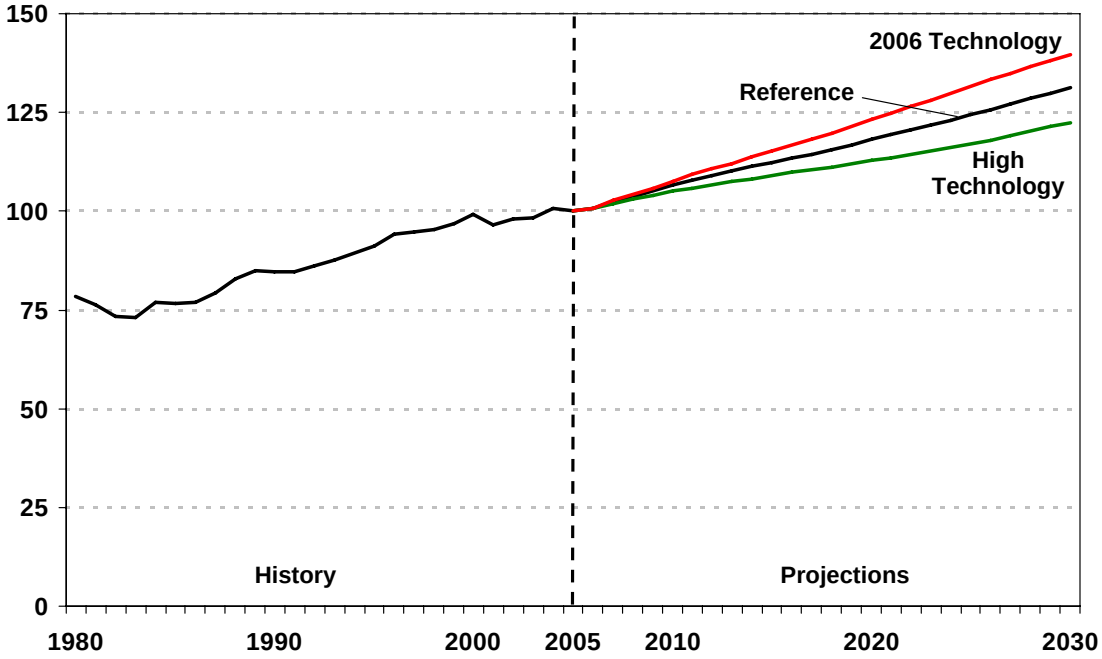

Figure 6. U.S. Energy Consumption by Fuel, 1980-2030 (quadrillion Btu)

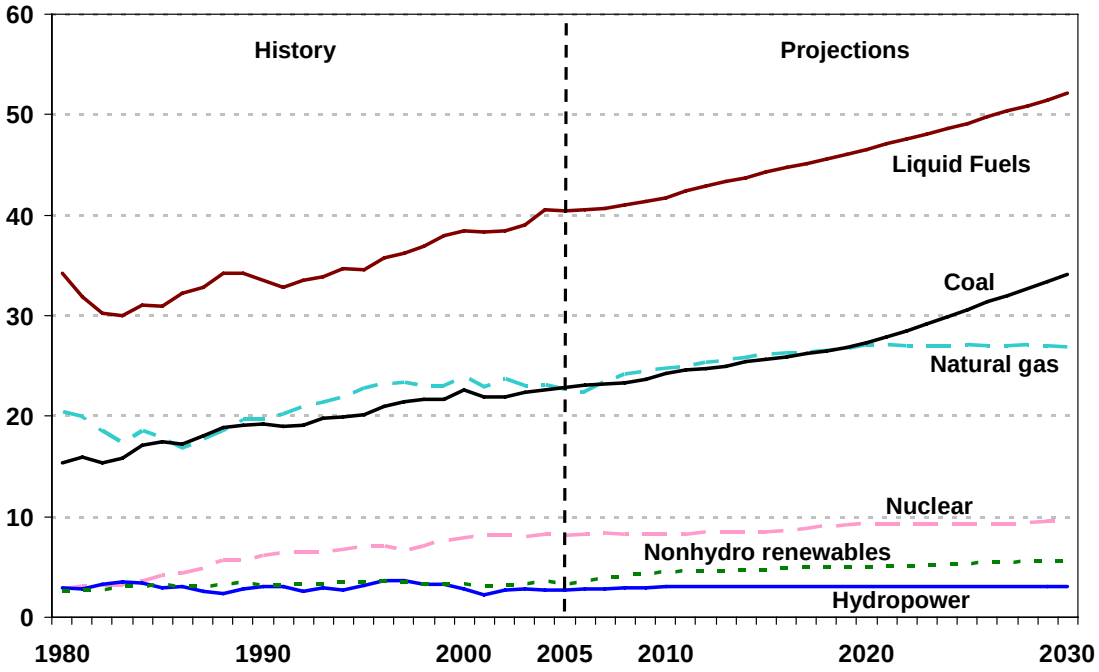

Figure 7. Energy Use per Capita and per Dollar of Real Gross Domestic Product, 1980-2030 (index, 1980 = 1)

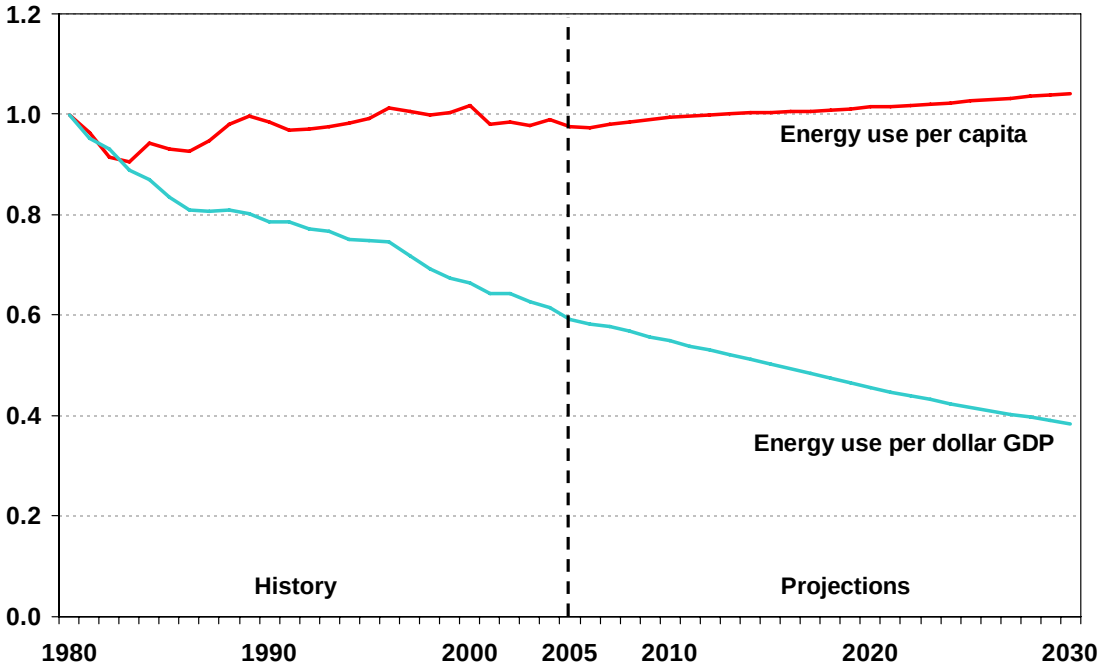

Figure 8. Liquid Fuels Supply, Consumption, and Net Imports, 1980-2030 (million barrels per day)

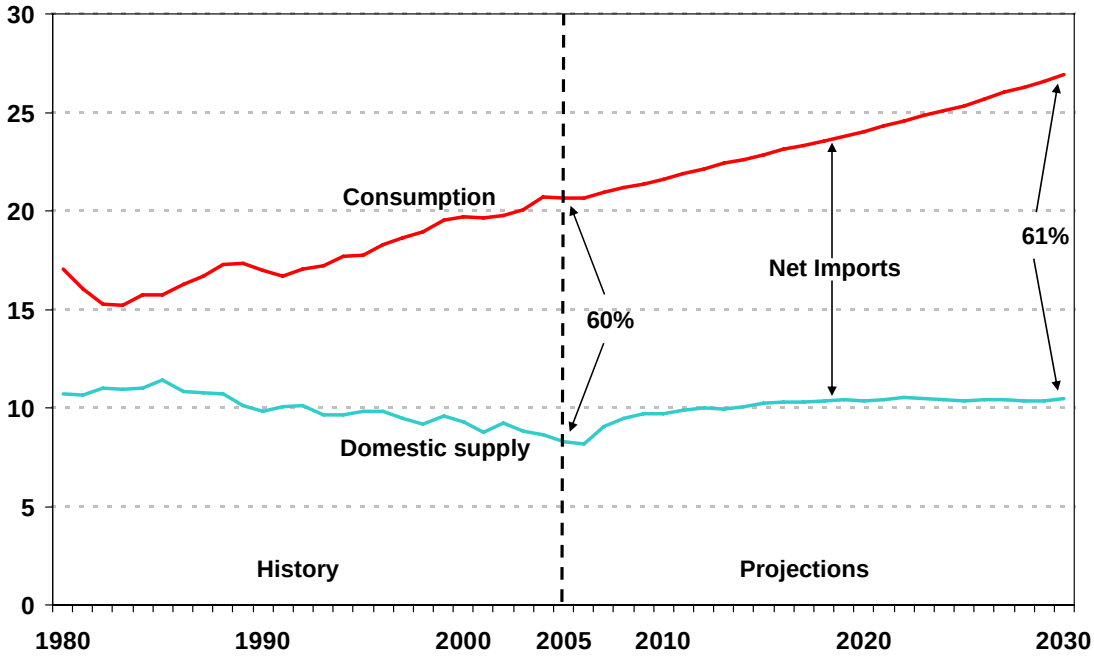

Figure 9. Liquid Fuels Supply, Consumption, and Net Imports in Three Cases, 1980-2030 (million barrels per day)

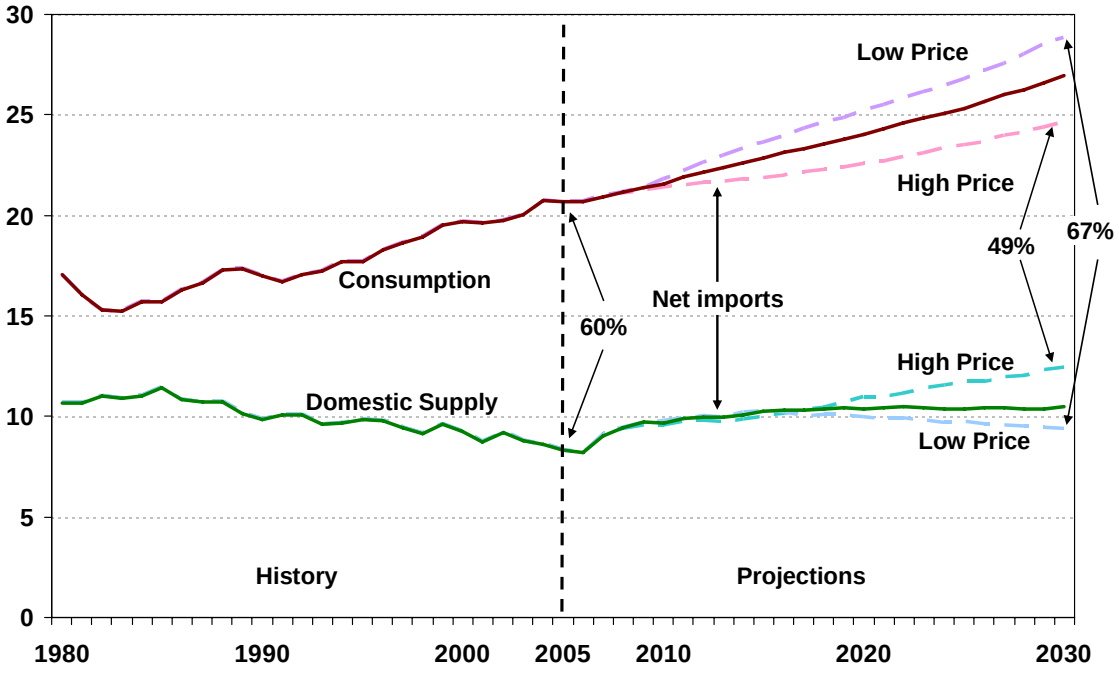

Figure 10. Petroleum Liquids Supply from Coal and Natural Gas in Two Cases, 2004-2030 (thousand barrels per day)

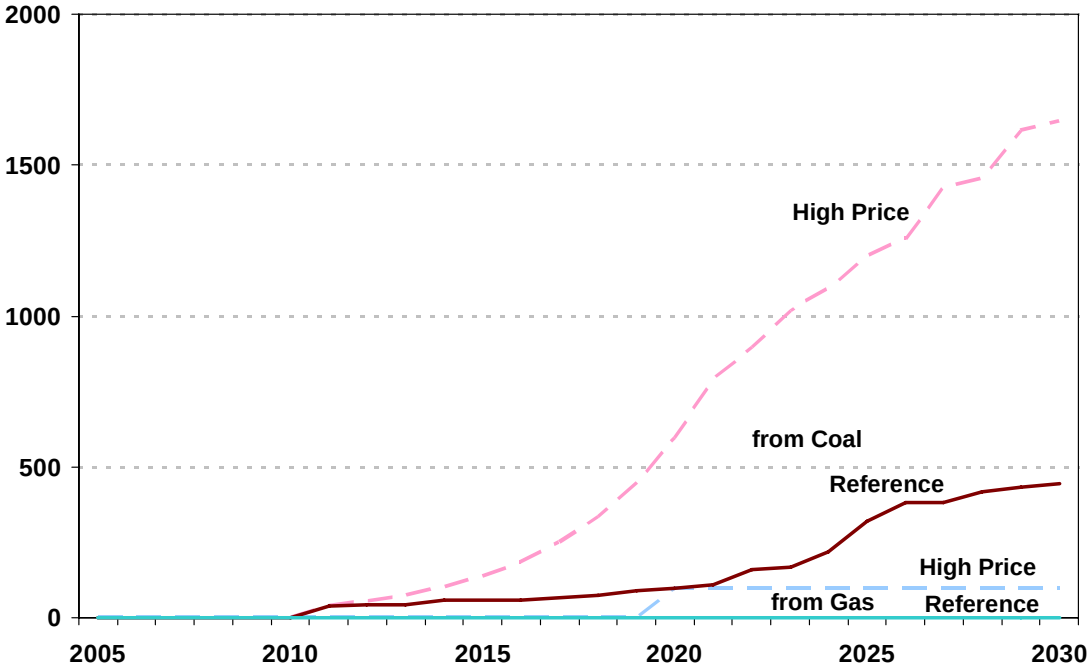

Figure 11. Natural Gas Production, Consumption, and Imports, 1980-2030 (trillion cubic feet)

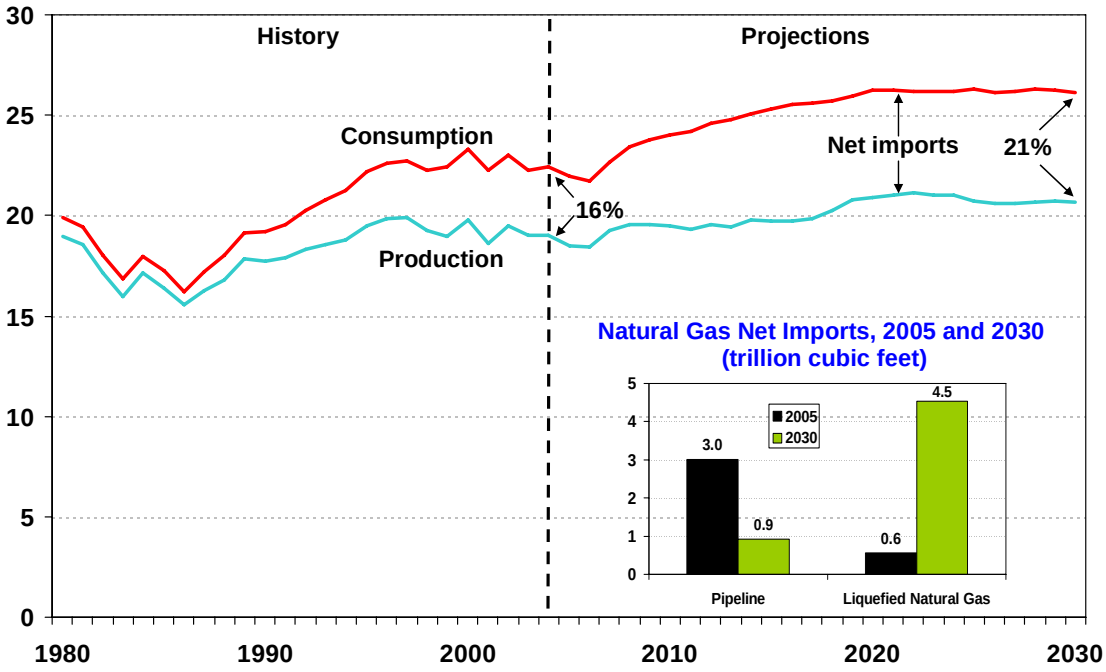

Figure 12. U.S. Coal Production by Region, 1980-2030 (million short tons)

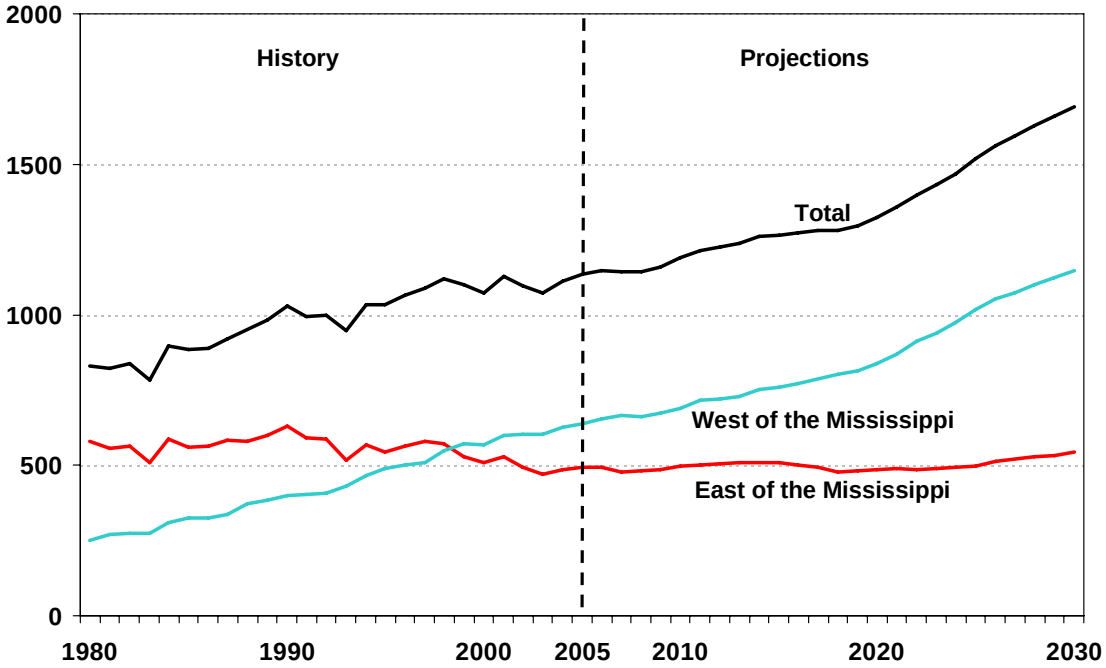

Figure 13. U.S. Electricity Generation by Fuel, 1980-2030 (billion kilowatthours)

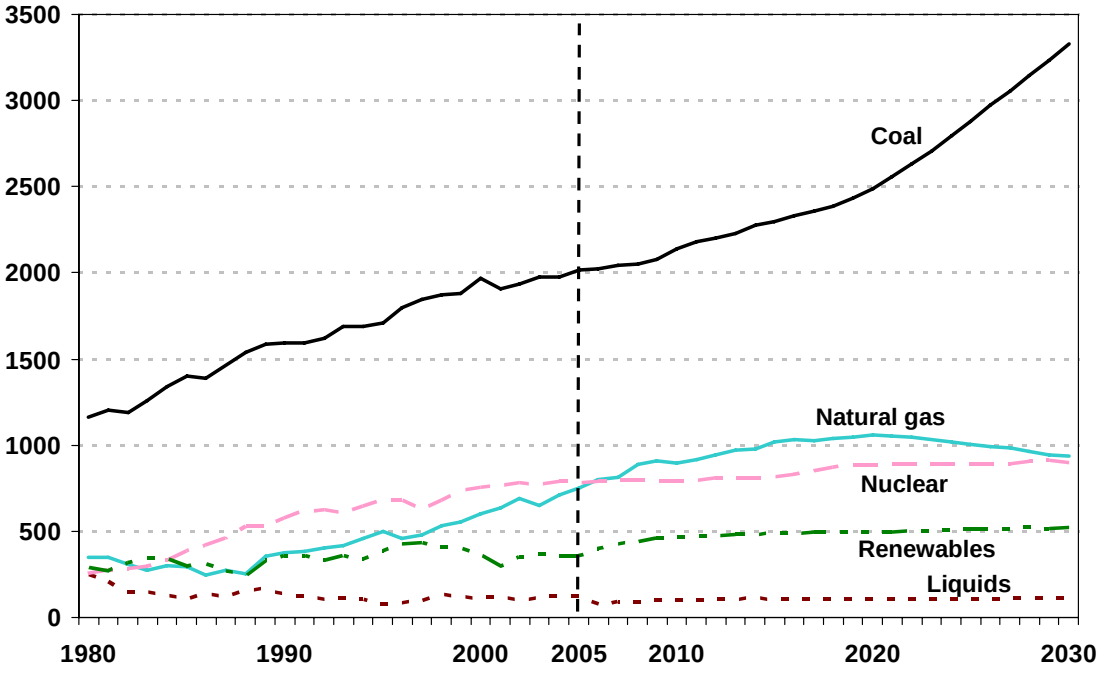

Figure 14. U.S. Carbon Dioxide Emissions by Sector and Fuel, 1990-2030 (million metric tons)